REMARKS

This Supplemental Amendment is filed in response to the Office Action dated June 28, 2004, to supplement the Amendment filed herein on June 7, 2004 which the Examiner indicated was non-responsive. This Amendment is in supplement to and presumes the entry of the Amendment filed on June 7, 2004.

Claims 1, 4, 6, 8, 10, 12, 14-15, 17, 19, 24, 26, 28, 30 and 38-48 are all the claims presently pending in the application. Claims 1 and 44-47 have been amended to more particularly define the invention. Claim 48 has been added to claim additional features.

It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicant specifically states that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claims 1, 6, 8, 12, 14-15, 19, 24, 26, 28, 30 and 38-44 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Morita, et al. (U.S. Patent No. 6,121,636), in view of Japanese Patent No. 11-126923. Claims 4, 6, 10, 12, 14-15, 17 and 19 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Morita, et al., in view of Japanese Patent No. 11-126923 and in further view of Steigerwald (GB Patent No. 2 333 899 A).

These rejections are respectfully traversed in the following discussion.

I. THE CLAIMED INVENTION

The claimed invention (e.g., as recited in claim 1) is directed to a light-emitting semiconductor device which includes a substrate, a plurality of semiconductor layers which include group III nitride group compound semiconductor and are laminated on the substrate by crystal growth, an emission layer formed on a first side of the substrate, and a mirror surface formed on a second side of the substrate opposite the first side.

The mirror surface includes a light transmission layer which directly contacts the substrate, has luminous transparency, and includes at least one material selected from a group consisting of metal oxides and ceramics. The mirror surface also includes a reflection layer which is formed on the light transmission layer, includes a metal, and reflects lights emitted from the emission layer. Importantly, the light transmission layer has a thickness of at least 5

nm.

Conventional light-emitting semiconductor devices may form a metal layer on a wafer which is fixed to an adhesive sheet. However, during such forming, the adhesive in the sheet volatizes causing undesirable gases to be generated. These gases react with the deposited metal layer causing the reflectivity and adhesion of the metal layer to be adversely affected (Application at page 3 at paragraph [0015]).

The claimed invention, on the other hand, includes a light transmission layer having a thickness of at least 5 nm. (Application at page 4, paragraphs [0026] and [0057]). This helps to ensure that an adhesive sheet (e.g., on which a wafer may be affixed) is sufficiently covered (e.g., by the light transmission layer) to prevent gases which are generated during formation of the reflection layer from reacting with the metal layer and deteriorating the reflectivity of the device (Application at paragraph [0071]).

II. THE PRIOR ART REFERENCES

A. The Morita and JP '923 References

The Examiner alleges that Morita would have been combined with the '923 reference to form the claimed invention of claims 1, 6, 8, 12, 14-15, 19, 24, 26, 28, 30 and 38-44. Applicant submits, however, that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention.

Morita discloses a semiconductor light emitting device which includes GaN semiconductor layers stacked on a front surface of a sapphire substrate, and a reflective film formed on a rear surface (Morita at Abstract).

The JP '923 reference discloses a method of forming a semiconductor device. In the JP '923 method, after a separation groove 21 is formed at a depth of nearly 3/4 of the thickness of a substrate from the reverse side of a substrate 11 along a dicing line, where wafer in which semiconductor layer is formed on the substrate is set, a separating groove 22 is formed until the substrate appears at a position corresponding to the separation groove 21 from a semiconductor layer side. Then, a reverse side 11b is polished, the substrate 11 is thinned to an extent where the trace of the separation groove 22 remains, a metal layer 10 is formed due to the deposition of Al on the entire portion of the reverse side 11b, and the

groove 23 corresponding to the separation groove 21 is formed.

An adhesive sheet 24 is then (e.g., after formation of the metal layer) applied onto an electrode pad 20, and scribing is made from the side of the metal layer 10 along the groove 23, thus forming a scribe line. Then, a load is applied to the wafer for braking, thus manufacturing a light-emitting element where the metal layer 10 is formed on the reverse side 11b. Light advancing towards the side of the substrate 11 is reflected by the metal layer 10 being formed on the reverse side 11b, and light take-out efficiency from the sides of electrodes 18A and 18B is improved, thus obtaining high emission intensity (JP '923 at Abstract; Figures 3-7).

However, Applicant submits that these references would not have been combined as alleged by the Examiner. Indeed, these references are directed to different problems and solutions.

Specifically, Morita is intended to provide a device having good luminance when bonded to a lead frame with an adhesive, whereas JP '23 is merely directed to a scribing method used to form a device having a metal on a reverse side of a substrate. Therefore, these references are unrelated, and no person of ordinary skill in the art would have considered combining these disparate references, absent impermissible hindsight.

Further, Applicant submits that the Examiner can point to no motivation or suggestion in the references to urge the combination as alleged by the Examiner. Indeed, contrary to the Examiner's allegations, neither of these references teach or suggest their combination. Therefore, Applicant respectfully submits that one of ordinary skill in the art would not have been so motivated to combine the references as alleged by the Examiner. Therefore, the Examiner has failed to make a prima facie case of obviousness.

Moreover, Applicant submits that neither Morita, nor JP '923, nor any combination thereof, teaches or suggests a mirror surface "*wherein said light transmission layer comprises a thickness of at least 5 nm*", as recited, for example, in claim 1.

As noted above, unlike conventional light-emitting semiconductor devices, the claimed invention, includes a light transmission layer having a thickness of at least 5 nm. (Application at page 4, paragraphs [0026] and [0057]). This helps to ensure that an adhesive sheet (e.g., on which a wafer may be affixed) is sufficiently covered (e.g., by the light transmission layer) to prevent gases which are generated during formation of the reflection

layer from reacting with the metal layer and deteriorating the reflectivity of the device (Application at paragraph [0071]).

Clearly, Morita does not teach or suggest these novel features. The Examiner attempts to rely on Morita at col. 5, lines 18-23 to support his allegations. However, the Examiner is incorrect.

Indeed, this passage in Morita merely discloses a "smoothing film" made of SiO_2, SiN or glass formed on the rear surface of a substrate. That is, the purpose of the film in Morita is merely to "smooth" a surface, and has nothing to do with preventing volatized gases from reacting with a metal during formation of a reflection layer.

In fact, nowhere does Morita even teach or suggest a preferred thickness of the "smoothing layer", although Applicant respectfully submits that such a "smoothing film" would likely be very thin. Thus, Morita certainly does not teach or suggest a light transmission layer having a thickness of at least 5 nm.

Neither are the novel features of the claimed invention taught or suggested by the JP '923 reference. Indeed, as noted above, the JP '923 reference merely teaches a metal layer 10 formed on a substrate 11. Nowhere does the JP '923 reference teach or suggest a light transmission layer formed between a substrate and the metal layer 10. Thus, JP '923 certainly does not teach or suggest a light transmission layer having a thickness of at least 5 nm.

Moreover, Applicant would point out that the JP '923 reference teaches that the adhesive layer 24 is not even formed on the device until after formation of the metal layer 10 (JP '923 at Abstract). Therefore, there is no concern with gases being generated and reacting with the metal layer 10. Therefore, the thickness of any layer formed between the metal layer 10 and the substrate would likely be considered not relevant to preventing an adverse mixing of gases from the adhesive sheet during formation of the metal layer 10 in the JP '923 reference.

Therefore, Applicant submits that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention. Therefore, the Examiner is respectfully requested to withdraw this rejection.

B. The Steigerwald Reference

The Examiner alleges that the alleged Morita/JP '923 combination would have been further combined with Steigerwald to form the claimed invention of claims 4, 6, 10, 12, 14-15, 17 and 19 Applicant submits, however, that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention.

Steigerwald discloses a light-emitting diode (LED) in which an opaque material 14 is placed between the LED die 16 and the die attach epoxy 20. The opaque material 14 may be used to improve thermal resistance or light output of the LED (Steigerwald at Abstract).

However, Applicant submits that these references would not have been combined as alleged by the Examiner. Indeed, these references are directed to different problems. Specifically, Morita is intended to prevent a deterioration in luminance and JP '923 is directed to a scribing method, whereas Steigerwald is intended to improve the reliability of LED packages. Clearly, no person of ordinary skill in the art would have considered combining these references.

Further, Applicant submits that the Examiner can point to no motivation or suggestion in the references to urge the combination as alleged by the Examiner. Indeed, contrary to the Examiner's allegations, neither of these references teach or suggest their combination. Therefore, Applicant respectfully submits that one of ordinary skill in the art would not have been so motivated to combine the references as alleged by the Examiner. Therefore, the Examiner has failed to make a prima facie case of obviousness.

Moreover, Applicant submits that neither Morita, nor JP '923, nor Steigerwald, nor any combination thereof, teaches or suggests a mirror surface having Moreover, Applicant submits that neither Morita, nor JP '923, nor any combination thereof, teaches or suggests a mirror surface *"wherein said light transmission layer comprises a thickness of at least 5 nm"*, as recited, for example, in claim 1.

As noted above, unlike conventional light-emitting semiconductor devices, the claimed invention, includes a light transmission layer having a thickness of at least 5 nm. (Application at page 4, paragraphs [0026] and [0057]). This helps to ensure that an adhesive sheet (e.g., on which a wafer may be affixed) is sufficiently covered (e.g., by the light transmission layer) to prevent gases which are generated during formation of the reflection

layer from reacting with the metal layer and deteriorating the reflectivity of the device (Application at paragraph [0071]).

Clearly, Steigerwald does not teach or suggest these novel features. Indeed, the Examiner does not even rely upon Steigerwald as allegedly disclosing this feature.

In fact, Steigerwald merely discloses an opaque material 14 which may be used to improve thermal resistance. Thus, Steigerwald is completely unrelated to the claimed invention. Indeed, nowhere does Steigerwald teach or suggest a mirror surface (e.g., mirror structure) which includes a light transmission layer having a thickness of at least 5 nm. Therefore, even if combined, Steigerwald does not make up for the deficiencies of the alleged Morita/JP '923 combination.

Therefore, Applicant submits that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention. Therefore, the Examiner is respectfully requested to withdraw this rejection.

III. FORMAL MATTERS AND CONCLUSION

In view of the foregoing, Applicant submits that claims 1, 4, 6, 8, 10, 12, 14-15, 17, 19, 24, 26, 28, 30 and 38-48, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date: 7/22/04

Phillip E. Miller, Esq.
Registration No. 46,060

McGinn & Gibb, PLLC
8321 Old Courthouse Road, Suite 200
Vienna, VA 22182-3817
(703) 761-4100
Customer No. 21254

CERTIFICATE OF FACSIMILE TRANSMISSION

I hereby certify that the foregoing Amendment was filed by facsimile with the United States Patent and Trademark Office, Examiner Bradley Baumeister, Group Art Unit # 2815 at fax number (703) 872-9306 this 22nd day of July, 2004.

Phillip E. Miller
Reg. No. 46,060